

# APPENDICES

Form. (1). No.....

**Observation checklist for diarrhea disease management in children under 5.**

Name of observer. \_\_\_\_\_, Date. \_\_\_\_\_, Place. \_\_\_\_\_

1. Patient's age. \_\_\_\_\_ 2. Gender. \_\_\_\_\_ 3. Chief complaint. \_\_\_\_\_

4. Duration of illness. \_\_\_\_\_ 5. Clinical findings. \_\_\_\_\_

6. Diagnosis. \_\_\_\_\_ 7. Treatment given \_\_\_\_\_

**Mark (✓) in the respective box when the physician perform the stated action and (X) when he doesn't. ( \* ) to be filled out by researcher only.**

No.	Items.	(✓) or (X)	Score*
1.	Rehydration therapy		
	A. prescription of ORS		
	B. prescription of fluid other than ORS		
	C. prescription of fluid not recommended by Diarrhea Project		
2.	Prescription of drugs		
	A. prescription of antibiotics.		
	B. prescription of symptomatic drugs.		
3.	Dietary advice		
	A. suspend all food		
	B. suspend solid food		
	C. stop milk feeding		
4.	Counseling to the mother/ caregiver		
	A. giving information on the alarm signs for referral		
	B. verification on understanding of mother/ caregiver		
5.	Total score		

**Appendix -II****Data master sheet (sample)**

**For the analysis of data compiled from observation checklists (form.1.) of performance in the management of childhood diarrhea**

Sr.	Variables													Total score	
	1(0/1) <sup>o</sup>				2 (0/1) <sup>o</sup>			3 (0/1) <sup>o</sup>				4 (0/1) <sup>o</sup>			
	a	b	c	s	a	b	s	a	b	c	s	a	b		s
1.															
2.															
3.															
4.															
5.															
6.															
7.															
8.															
9.															
Mean (SD)															

Remarks: Variable 1= rehydration therapy

Variable 2= prescribing drugs

Variable 3= dietary advice

Variable 4= counseling to mother or caregiver

(%) = percentage of physicians who did the respective action described in the form (1)

<sup>o</sup> 0 = the physician doesn't do the respective action described in form (1)

**°1 = the physician does the respective action described in form (1)**

**a, b, c = action of defined variables   s = score for respective variable**

**Appendix - III****Self-administered questionnaire**

**(Please, answer all the questions. Your answer will be very much helpful and useful for continuing education program to improve medical practice. Thank you for your cooperation.)**

**Part. A. Background information of the physician.**

1. Age (yr.) \_\_\_\_\_ 2. Gender. \_\_\_\_\_ 3. Year of graduation.  
19 \_\_\_\_\_
4. Duration of general practice (yr.) \_\_\_\_\_
5. Average daily number of consultation \_\_\_\_\_
6. Average fee for single consultation \_\_\_\_\_
7. Duration of clinic hour per day \_\_\_\_\_

**Part. B. Please tick the answer that corresponds to your answer, or where necessary write down your answer in the given space.**

1. Do you have any learning experience during last year?
  1. Yes.
  2. No.

**If yes, go to question 2 through 7 and if no, go to question 8 and 9.**

2. Please specify your learning experience.
  1. Reading medical journals and texts.
  2. Discussion with colleagues, seniors and specialists on problems encountered in practice.
  3. Attending seminars, conferences, symposia, workshops, and courses.
  4. Any two of the above.
  5. 1, 2, and 3.

3. Do you have other learning experience not included in the above categories?

1. Yes.

2. No.

If yes,

4. Please describe it. \_\_\_\_\_

\_\_\_\_\_

---

Please specify frequency of your learning experience accordingly.

5. For reading journals and text, how many hours per week?

\_\_\_\_\_

6. For discussion with colleagues, seniors and specialists, how many times per month?

\_\_\_\_\_

7. For attending seminars, conferences, workshops, symposia and courses, how many times during last year?

\_\_\_\_\_

8. Are there any reasons that you can not get learning experiences?

1. Yes.

2. No.

If yes,

9. Describe reason(s).

\_\_\_\_\_

\_\_\_\_\_

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Please describe your opinion.

10. Continuing learning experiences are helpful for the improvement of quality of care provided by private physicians.

1. Strongly agree.            2. Agree.  
 3. Not sure.                4. Disagree.            5. Strongly disagree.

**Part. C. About management of the childhood diarrhea.**

Please, give your opinion freely for all the statements. Make (✓) in the box that corresponds to your opinion.

Sr.	questions	Strongly agree	agree	Not sure	disagree	Strongly disagree
1.	ORS produced by the government doesn't make good taste for the children					
2.	Now- a-day mothers of children suffering from diarrhea demand ORS.					
3.	Mothers of children suffering from diarrhea accept use of other good tasted commercial ORS.					
4.	Use of homemade, food-based fluid also should be encouraged in the management of diarrhea.					

5.	Use of antibiotics makes me more comfortable.					
Sr.	questions	Strongly agree	agree	Not sure	disagree	Strongly disagree
6.	Use of antibiotics in every case of diarrhea may lead to waste of money.					
7.	Use of adsorbent drugs can promote satisfaction of families of children suffering from diarrhea.					
8.	Use of adsorbent drugs makes more harms than benefits.					
9.	Temporary withholding of diet is sometimes useful for the management of childhood diarrhea.					
10.	Continued feeding should be encouraged to enhance recovery of the ailing children.					
11.	Counseling to mothers is very time consuming and it is not easy to do in every case of diarrhea.					
12.	Counseling to mother is an important complementary to treatment.					



13.	Diarrhea in children is a trivial illness curing without much attention.					
Sr.	questions	Strongly agree	agree	Not sure	disagree	Strongly disagree
14.	Proper simple management can prevent deaths from diarrhea.					
15.	Use of antibiotics should be restricted to some cases in the management of diarrhea.					
16.	Use of antibiotics can achieve more patients' satisfaction.					
17.	Failure in the treatment of childhood diarrhea is often due to failure of mother to follow the advice of physician.					
18.	Private sector can be a task force for the prevention of death from diarrhea.					

**Thank you for cooperation.**

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Appendix - IV

**DATA MASTER SHEET FOR ANALYSIS OF FORM 2 PART A AND PART B**

SR	A1	A2	A3	A4	A5	A6	A7	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
1.																	
2.																	
3.																	
4.																	
5.																	
6.																	
7.																	
8.																	
9.																	
10.																	
11.																	
12.																	

**Appendix - V****Health profiles of the study townships (1997)****Hlaingthaya Township****Yangon Division**

1. Area 68.6 sq km

2. Population 159988

Male 79915

Female 80073

&lt;5 yr 25224

3. health facilities

Government hospital 1(25 bedded)

Urban health center 1

Rural health center 1

Sub centers 4

School health center 1

Private clinics 21

4. health related NGOs

M.M.C.W.A

U.S.D.A

M.M.A

Nurses Association

HA Association

Red Cross Society

5. Leading causes of morbidity and mortality

Sr.	Morbidity	Mortality
1.	Diarrhea	Malaria
2.	ARI	Diarrhea
3.	Malaria	Viral hepatitis
4.	Dysentery	Snake bite

**Shwepyitha Township****Yangon Division**

6. Area 39.3 sq km

7. Population 138350

Male 69107

Female 69243

<5 yr 18800

8. health facilities

Government hospital 1 (25 bedded)

Urban health center 1

Rural health center 1

Sub centers 4

School health center 1

Private clinics 19

9. health related NGOs

M.M.C.W.A

U.S.D.A

M.M.A

Nurses Association

HA Association

Red Cross Society

10. Leading causes of morbidity and mortality

Sr.	Morbidity	Mortality
1.	ARI	
2.	Diarrhea	
3.	TB	
4.	Malaria	

# THE TREATMENT OF DIARRHOEA

## A manual for physicians and other senior health workers

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*Division of Diarrhoeal and Acute Respiratory Disease Control*

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## 4. MANAGEMENT OF ACUTE DIARRHOEA (WITHOUT BLOOD)

### 4.1 Objectives

The objectives of treatment are to:

- *prevent dehydration*, if there are no signs of dehydration;
- *treat dehydration*, when it is present;
- *prevent nutritional damage*, by feeding during and after diarrhoea.

These objectives can be achieved by following the selected treatment plan, as described below. The management of suspected cholera is described in section 5.

### 4.2. Treatment Plan A: home therapy to prevent dehydration and malnutrition

Children with no signs of dehydration need extra fluids and salt to replace their losses of water and electrolytes due to diarrhoea. If these are not given, signs of dehydration may develop.

Mothers should be taught how to prevent dehydration at home by giving the child more fluid than usual, how to prevent malnutrition by continuing to feed the child, and why these actions are important. They should also know what signs indicate that the child should be taken to a health worker. These steps are summarized in the *three rules of Treatment Plan A*:

#### 4.2.1 Rule 1: Give the child more fluids than usual, to prevent dehydration

##### What fluids to give

Many countries have designated recommended home fluids. *Wherever possible, these should include at least one fluid that normally contains salt* (see below). Plain clean water should also be given. Other fluids should be recommended that are frequently given to children in the area, that mothers consider acceptable for children with diarrhoea, and that mothers would be likely to give in increased amounts when advised to do so.

##### Suitable fluids

Most fluids that a child normally takes can be used. It is helpful to divide suitable fluids into two groups:

*Fluids that normally contain salt, such as:*

- ORS solution
- salted drinks (e.g. salted rice water or a salted yoghurt drink)
- vegetable or chicken soup with salt.

Teaching mothers to add salt (about 3g/l) to an unsalted drink or soup during diarrhoea is also possible, but requires a sustained educational effort.

A home-made solution containing 3g/l of table salt and 18g/l of common sugar (sucrose) is effective but is not generally recommended because the recipe is often forgotten, the ingredients may not be available or too little may be given.

*Fluids that do not contain salt, such as:*

- plain water
- water in which a cereal has been cooked (e.g. unsalted rice water)
- unsalted soup
- yoghurt drinks without salt
- green coconut water
- weak tea (unsweetened)
- unsweetened fresh fruit juice.

##### Unsuitable fluids

A few fluids are potentially dangerous and should be avoided during diarrhoea. Especially important are drinks sweetened with sugar, which can cause osmotic diarrhoea and hypernatraemia. Some examples are:

- soft drinks

- sweetened fruit drinks
- sweetened tea.

Other fluids to avoid are those with stimulant, diuretic or purgative effects, for example:

- coffee
- some medicinal teas or infusions.

### How much fluid to give

The general rule is: give as much fluid as the child or adult wants until diarrhoea stops. As a guide, after each loose stool, give:

- children under 2 years of age: 50-100 ml (a quarter to half a large cup) of fluid;
- children aged 2 up to 10 years: 100-200 ml (a half to one large cup);
- older children and adults: as much fluid as they want.

#### 4.2.2 Rule 2: Continue to feed the child, to prevent malnutrition

Feeding should be continued during diarrhoea and increased afterwards. Food should *never* be withheld and the child's usual foods should *not* be diluted. Breastfeeding should *always* be continued. The aim is to give as much nutrient-rich food as the child will accept. Most children with watery diarrhoea regain their appetite after dehydration is corrected, whereas those with bloody diarrhoea often eat poorly until the illness resolves.

When food is given, sufficient nutrients are usually absorbed to support continued growth and weight gain. Continued feeding also speeds the recovery of normal intestinal function, including the ability to digest and absorb various nutrients. In contrast, children whose food is restricted or diluted lose weight, have diarrhoea of longer duration, and recover intestinal function more slowly.

### What foods to give

This depends on the child's age, food preferences and pre-illness feeding pattern; cultural practices are also important. *In general, foods suitable for a child with diarrhoea are the same as those required by healthy children.* Specific recommendations are given below.

#### *Milk*

- *Infants of any age who are breastfed* should be allowed to breastfeed as often and as long as they want. Infants will often breastfeed more than usual; this should be encouraged.
- *Infants who are not breastfed* should be given their usual milk feed (or formula) at least every three hours, if possible by cup. Special commercial formulas advertised for use in diarrhoea are expensive and unnecessary; they should *not* be given routinely. Clinically significant milk intolerance is rarely a problem.
- *Infants below 4 months of age who take breastmilk and other foods* should receive increased breastfeeding. As the child recovers and the supply of breastmilk increases, other foods should be decreased (and given by cup, not bottle). This usually takes about one week. If possible, the infant should become exclusively breastfed (see Annex 6).

There is no value in routinely testing the stools of infants for pH or reducing substances. Such tests are

oversensitive, often indicating impaired absorption of lactose when it is not clinically important. It is more important to monitor the child's clinical response (e.g. weight gain, general improvement): Milk intolerance is only clinically important when milk feeding causes a prompt increase in stool volume and a return or worsening of the signs of dehydration, often with loss of weight.

#### *Other foods*

If the child is at least 6 months old or is already taking soft foods, he or she should be given cereals, vegetables and other foods, in addition to milk. If the child is over 6 months and such foods are not yet being given, they should be started during the diarrhoea episode or soon after it stops.

Recommended foods should be culturally acceptable, readily available, have a high content of energy and provide adequate amounts of essential micronutrients. They should be wellcooked, and mashed or ground to make them easy to digest; fermented foods are also easy to digest. Milk should be mixed with a cereal. If possible, 510 ml of vegetable oil should be added to each serving of cereal. Meat, fish or egg should be given, if available. Foods rich in potassium, such as bananas, green coconut water and fresh fruit juice are beneficial.

#### How much food and how often

Offer the child food every three or four hours (six times a day). Frequent, small feedings are tolerated better than less frequent, large ones.

After the diarrhoea stops, continue giving the same energyrich foods and provide one more meal than usual each day for at least two weeks. If the child is malnourished, extra meals should be given until the child has regained normal weight-for-height.

#### **4.2.3 Rule 3: Take the child to a health worker if there are signs of dehydration or other problems**

The mother should take her child to a health worker if the child:

- starts to pass many watery stools;
- has repeated vomiting;
- becomes very thirsty;
- is eating or drinking poorly;
- develops a fever;
- has blood in the stool; or
- the child does not get better in three days.

### **4.3 Treatment Plan B: oral rehydration therapy for children with some dehydration**

Children with some dehydration should receive oral rehydration therapy (ORT) with ORS solution in a health facility following Treatment Plan B, as described below.

#### **4.3.1 How much ORS solution is needed?**

Use Table 2 to estimate the amount of ORS solution needed for rehydration. If the child's weight is known, this should be used to determine the *approximate* amount of solution needed. The amount may also be estimated by multiplying the child's weight in kg times 75 ml. If the child's weight is not known, select the approximate amount according to the child's age.



The *exact* amount of solution required will depend on the child's dehydration status. Children with more marked signs of dehydration, or who continue to pass frequent watery stools, will require more solution than those with less marked signs or who are not passing frequent stools. *If a child wants more than the estimated amount of ORS solution, and there are no signs of overhydration, give more.*

Oedematous (puffy) eyelids are a sign of *overhydration*. If this occurs, stop giving ORS solution, but give breastmilk or plain water, and food. Do not give a diuretic. When the oedema has gone, resume giving ORS solution or home fluids according to Treatment Plan A.

Table 2: Guidelines for treating children and adults with some dehydration

APPROXIMATE AMOUNT OF ORS SOLUTION TO GIVE IN THE FIRST 4 HOURS						
Age: <sup>a</sup>	Less than 4 months	4-11 months	12-23 months	2-4 years	5-14 years	15 years or older
Weight:	Less than 5 kg	5-7.9 kg	8-10.9 kg	11-15.9 kg	16-29.9 kg	30 kg or more
in ml	200-400	400-600	600-800	800-1200	1200-2200	2200-4000

<sup>a</sup> Use the patient's age only when you do not know the weight. The approximate amount of ORS required (in ml) can also be calculated by multiplying the patient's weight in kg by 75.

- If the patient wants more ORS than shown, give more.
- Encourage the mother to continue breastfeeding her child.
- For infants under 6 months who are not breastfed, also give 100-200ml clean water during this period.

NOTE: During the initial stages of therapy, while still dehydrated, adults can consume up to 750 ml per hour, if necessary, and children up to 20 ml per kg body weight per hour.

#### 4.3.2 How to give ORS solution

A family member should be taught to prepare and give ORS solution. The solution should be given to infants and young children using a clean spoon or cup. Feeding bottles should *not* be used. For babies, a dropper or syringe (without the needle) can be used to put small amounts of solution into the mouth. Children under 2 years of age should be offered a teaspoonful every 12 minutes; older children (and adults) may take frequent sips directly from the cup.

Vomiting often occurs during the first hour or two of treatment, especially when children drink the solution too quickly, but this rarely prevents successful oral rehydration since most of the fluid is absorbed. After this time vomiting usually stops. If the child vomits, wait 5-10 minutes and then start giving ORS solution again, but more slowly (e.g. a spoonful every 23 minutes).

#### 4.3.3 Monitoring the progress of oral rehydration therapy

Check the child from time to time during rehydration to ensure that ORS solution is being taken satisfactorily and that signs of dehydration are not worsening. If at any time the child develops signs of severe dehydration, shift to Treatment Plan C.

After four hours, reassess the child fully, following the guidelines in Table 1. Then decide what treatment to give next:

- If signs of *severe dehydration* have appeared, intravenous (IV) therapy should be started following Treatment Plan C. This is very unusual, however, occurring only in children who drink ORS solution

- insufficient intake of ORS solution owing to fatigue or lethargy;
- frequent, severe vomiting.

Such children should be given ORS solution by nasogastric (NG) tube or Ringer's Lactate Solution IV (75 ml/kg in four hours), usually in hospital. After confirming that the signs of dehydration have improved, it is usually possible to resume ORT successfully.

Rarely, ORT should not be given. This is true for children with:

- abdominal distension with paralytic ileus, usually caused by opiate drugs (e.g. codeine, loperamide) and hypokalaemia;
- glucose malabsorption, indicated by a marked increase in stool output, failure of the signs of dehydration to improve and a large amount of glucose in the stool when ORS solution is given.

In these situations, rehydration should be given IV until diarrhoea subsides; NG therapy should *not* be used.

#### 4.3.7 Giving food

Except for breastmilk, food should not be given during the initial four-hour rehydration period. However, children continued on Treatment Plan B longer than four hours should be given some food every 34 hours as described in Treatment Plan A. *All children older than 4-6 months should be given some food before being sent home.* This helps to emphasize to mothers the importance of continued feeding during diarrhoea.

### 4.4 Treatment Plan C: for patients with severe dehydration

#### 4.4.1 Guidelines for intravenous rehydration

The preferred treatment for children with severe dehydration is rapid intravenous rehydration, following Treatment Plan C. If possible, the child should be admitted to hospital. Guidelines for intravenous rehydration are given in Table 3.

Children who can drink, even poorly, should be given ORS solution by mouth until the IV drip is running. In addition, *all* children should start to receive some ORS solution (about 5 ml/kg/h) when they can drink without difficulty, which is usually within 34 hours (for infants) or 12 hours (for older patients). This provides additional base and potassium, which may not be adequately supplied by the IV fluid.

**Table 3: Guidelines for intravenous treatment of children and adults with severe dehydration**

- Start IV fluids immediately. If the patient can drink, give ORS by mouth until the drip is set up. Give 100 ml/kg Ringer's Lactate Solution<sup>a</sup> divided as follows:

Age	First give	Then give
Infants (under 12 months)	30 ml/kg in: 1 hour <sup>b</sup>	70 ml/kg in: 5 hours
Older	30 minutes <sup>b</sup>	2½ hours

- Reassess the patient every 1-2 hours. If hydration is not improving, give the IV drip more rapidly.
- After six hours (infants) or three hours (older patients), evaluate the patient using the assessment chart. Then choose the appropriate Treatment Plan (A, B or C) to continue treatment.

<sup>a</sup> If Ringer's Lactate Solution is not available, normal saline may be used (See Annex 2).

b Repeat once if radial pulse is still very weak or not detectable.

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#### 4.4.2 Monitoring the progress of intravenous rehydration

Patients should be reassessed every 15-30 minutes until a strong radial pulse is present. Thereafter, they should be reassessed at least every hour to confirm that hydration is improving. If it is not, the IV drip should be given more rapidly.

When the planned amount of IV fluid has been given (after three hours for older patients, or six hours for infants), the child's hydration status should be reassessed fully, as shown in Table 1.

Ø *Look and feel* for all the signs of dehydration:

- If signs of *severe dehydration* are still present, repeat the IV fluid infusion as outlined in Treatment Plan C. This is very unusual, however, occurring only in children who pass large watery stools frequently during the rehydration period.
- If the child is improving but still shows signs of *some dehydration*, discontinue the IV infusion and give ORS solution for four hours, as specified in Treatment Plan B.
- If there are *no signs of dehydration*, follow Treatment Plan A. If possible, observe the child for at least six hours before discharge while the mother gives the child ORS solution, to confirm that she is able to maintain the child's hydration. Remember that the child will require therapy with ORS solution until diarrhoea stops.

If the child cannot remain at the treatment centre, teach the mother how to give treatment at home following Treatment Plan A, give her enough ORS packets for two days and teach her the signs that mean she should bring her child back.

#### 4.4.3 What to do if intravenous therapy is not available

If IV therapy is not available at the facility, but can be given nearby (i.e. within 30 minutes), send the child *immediately* for IV treatment. If the child can drink, give the mother some ORS solution and show her how to give it to her child during the journey.

If IV therapy is not available nearby, health workers who have been trained can give ORS solution by NG tube, at a rate of 20 ml/kg body weight per hour for six hours (total of 120 ml/kg body weight). If the abdomen becomes swollen, ORS solution should be given more slowly until it becomes less distended.

If NG treatment is not possible but the child can drink, ORS solution should be given by mouth at a rate of 20 ml/kg body weight per hour for six hours (total of 120 ml/kg body weight). If this rate is too fast, the child may vomit repeatedly. In that case, give ORS solution more slowly until vomiting subsides.

Children receiving NG or oral therapy should be reassessed at least every hour. If the signs of dehydration do not improve after three hours, the child must be taken immediately to the nearest facility where IV therapy is available. Otherwise, if rehydration is progressing satisfactorily, the child should be reassessed after six hours and a decision on further treatment made as described above for those given IV therapy.

If neither NG nor oral therapy is possible, the child should be taken *immediately* to the nearest facility where IV or NG therapy is available.

### 4.5 Electrolyte disturbances

Knowing the levels of serum electrolytes rarely changes the management of children with diarrhoea.

poorly and pass large watery stools frequently during the rehydration period.

- If the child still has signs indicating *some dehydration*, continue oral rehydration therapy by repeating Treatment Plan B. At the same time start to offer food, milk and other fluids, as described in Treatment Plan A, and continue to reassess the child frequently.

- If there are *no signs of dehydration*, the child should be considered fully rehydrated. When rehydration is complete:

- the skin pinch is normal;
- thirst has subsided;
- urine is passed;
- the child becomes quiet, is no longer irritable and often falls asleep.

Teach the mother how to treat her child at home with ORS solution and food following Treatment Plan A. Give her enough ORS packets for two days (see inside back cover). Also teach her the signs that mean she should bring her child back (page 11).

#### 4.3.4 Meeting normal fluid needs

While treatment to replace the existing water and electrolyte deficit is in progress the child's *normal daily fluid requirements* must also be met. This can be done as follows:

- *Breastfed infants*: Continue to breastfeed as often and as long as the infant wants, even *during* oral rehydration.
- *Nonbreastfed infants under 6 months of age*: During rehydration with ORS solution, give 100-200 ml of plain water by mouth. After completing rehydration, resume full strength milk (or formula) feeds. Give water and other fluids usually taken by the infant.
- *Older children and adults*: Throughout rehydration and maintenance therapy, offer as much plain water to drink as they wish, *in addition* to ORS solution.

#### 4.3.5 If oral rehydration therapy must be interrupted

If the mother and child must leave before rehydration with ORS solution is completed:

- show the mother how much ORS solution to give to finish the four-hour treatment at home;
- give her enough ORS packets to complete the four-hour treatment and to continue oral rehydration for two more days, as shown in Treatment Plan A;
- show her how to prepare ORS solution;
- teach her the three rules in Treatment Plan A for treating her child at home.

#### 4.3.6 When oral rehydration fails or is not appropriate

In about 5% of children the signs of dehydration do not improve during ORT, or they worsen after initial improvement. The usual causes are:

- continuing rapid stool loss (more than 15-20 ml/kg/hour), as occurs in some children with cholera;

Indeed, these values are often misinterpreted, leading to inappropriate treatment. It is usually *not helpful* to measure serum electrolytes. The disorders described below are *all* adequately treated by ORT with ORS solution.

#### 4.5.1 Hypernatraemia

Some children with diarrhoea develop *hypernatraemic dehydration*, especially when given drinks that are hypertonic owing to their content of sugar (e.g. soft drinks, commercial fruit drinks) or salt. These draw water from the child's tissues and blood into the bowel, causing the concentration of sodium in extracellular fluid to rise. If the solute in the drink is not fully absorbed, the water remains in the bowel, causing osmotic diarrhoea.

Children with hypernatraemic dehydration (serum  $\text{Na}^+ > 150 \text{ mmol/l}$ ) have thirst that is out of proportion to other signs of dehydration. Their most serious problem is convulsions, which usually occur when the serum sodium concentration exceeds  $165 \text{ mmol/l}$ , and especially when IV therapy is given. Seizures are much less likely when hypernatraemia is treated with ORS solution, which usually causes the serum sodium concentration to become normal within 24 hours.

#### 4.5.2 Hyponatraemia

Children with diarrhoea who drink mostly water, or watery drinks that contain little salt, may develop hyponatraemia (serum  $\text{Na}^+ < 130 \text{ mmol/l}$ ). Hyponatraemia is especially common in children with shigellosis and in severely malnourished children with oedema. Hyponatraemia is occasionally associated with lethargy and, less often, seizures. ORS solution is safe and effective therapy for nearly all children with hyponatraemia. An exception is children with oedema (see section 8), for whom ORS solution provides too much sodium.

#### 4.5.3 Hypokalaemia

Inadequate replacement of potassium losses during diarrhoea can lead to potassium depletion and hypokalaemia (serum  $\text{K}^+ < 3 \text{ mmol/l}$ ), especially in children with malnutrition. This can cause muscle weakness, paralytic ileus, impaired kidney function and cardiac arrhythmias. Hypokalaemia is worsened when base (bicarbonate or lactate) is given to treat acidosis without simultaneously providing potassium. Hypokalaemia can be prevented, and the potassium deficit corrected, by using ORS solution for rehydration therapy and by giving foods rich in potassium during diarrhoea and after it has stopped (see Section 4.2).

## **Curriculum Vitae**

**Name** Win Kyaw  
**Sex** Male  
**Nationality** Myanmar  
**Date of Birth** December 23, 1962

### **Education**

M. B., B. S. 1986 Institute of Medicine, Mandalay, Myanmar  
M. Med. Sc. 1997 Institute of Medicine, Yangon, Myanmar  
(Preventive and Tropical Medicine)

### **Work Experience**

1997 - up to now Medical Officer, Administration Division  
Department of Health, Ministry of Health,  
Yangon, Myanmar  
1994 to 1997 Civil Assistant Surgeon, Insein General Hospital  
Yangon, Myanmar  
1991 to 1994 Medical Officer, Directorate of Medical Services  
Ministry of Defense  
Yangon, Myanmar  
1987 to 1991 General practitioner, Pinlebu Township  
Sagaing Division, Upper Myanmar